

# Documenting the climate footprint of agriculture: different approaches

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# Short intro note

- ❑ Current society (and the world itself) is complex, and globally interconnected  
The modelling of its environmental impacts needs to be (somewhat) complex

- ❑ What's the question that we want to answer?
  - 'Country perspective'
  - 'Producer / consumer perspective'
  - 'Receptor (environment) perspective'



*Food for thoughts*



# What are the environmental impacts of a country?



## National Inventory Reports (NIR)

“country perspective”; emissions are reported in the country where they occur

➤ Paris Agreement; Methodology: “UNFCCC Annex I inventory reporting guidelines”;

DK (2020):  $\sim 40 \times 10^6$  tonne of  $\text{CO}_2\text{eq}$  +  
 $\sim 3 \times 10^6$  tonne of  $\text{CO}_2\text{eq}$  (LULUCF)

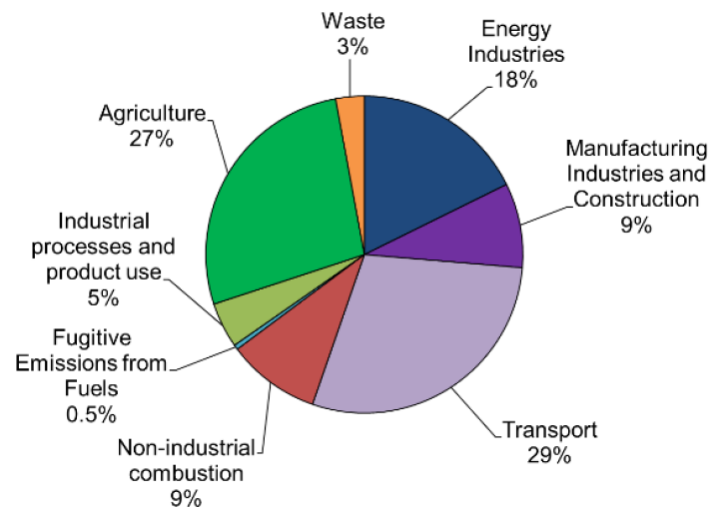
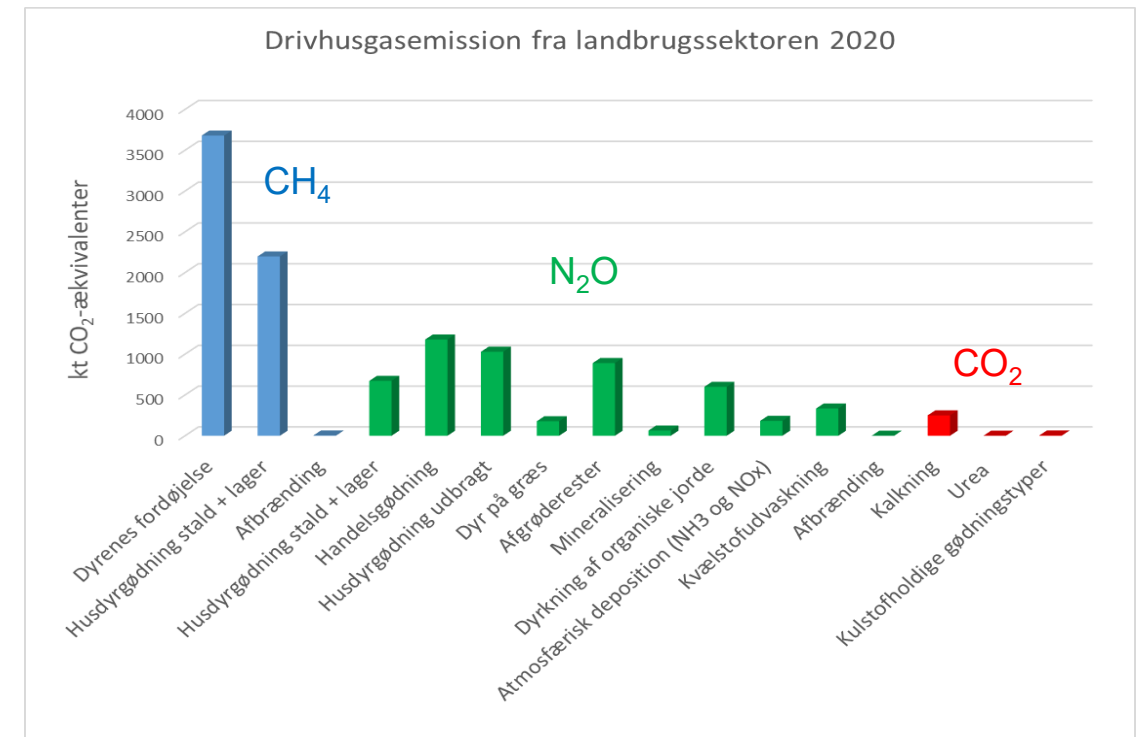


Figure ES.1 GHG emissions in  $\text{CO}_2\text{eq}$  distributed over the sectors in 2019 (excluding LULUCF and indirect  $\text{CO}_2$ ). DENMARK'S NATIONAL INVENTORY REPORT 2022





# What are the environmental impacts of a country? global market and impacts



- ❑ NIRs focus on Climate Change, but there are other areas of environmental concern
- ❑ The market is global (imports / exports), but the emissions occur locally  
Environmental impacts can be
  - Local (*e.g., freshwater toxicity, freshwater eutrophication, land use, water use, biodiversity loss*)
  - Global (*e.g., climate change*)
- ❖ Area of direct influence: within national borders, and EU borders  
National and EU environmental targets / regulations:  
*less fertilizer, less antibiotics, more organic products, increased animal welfare, only deforestation free soybeans...*

Note: burden shift and market shifts between countries may occur!



# What are the environmental impacts of a product?

Life Cycle Assessment (LCA) – ISO 14040, 14044

- LCA is “just” a tool that can be adapted based on the aim of the study
- (often) “producer / consumer perspective”



- Various mid-point impact categories (areas of concern):

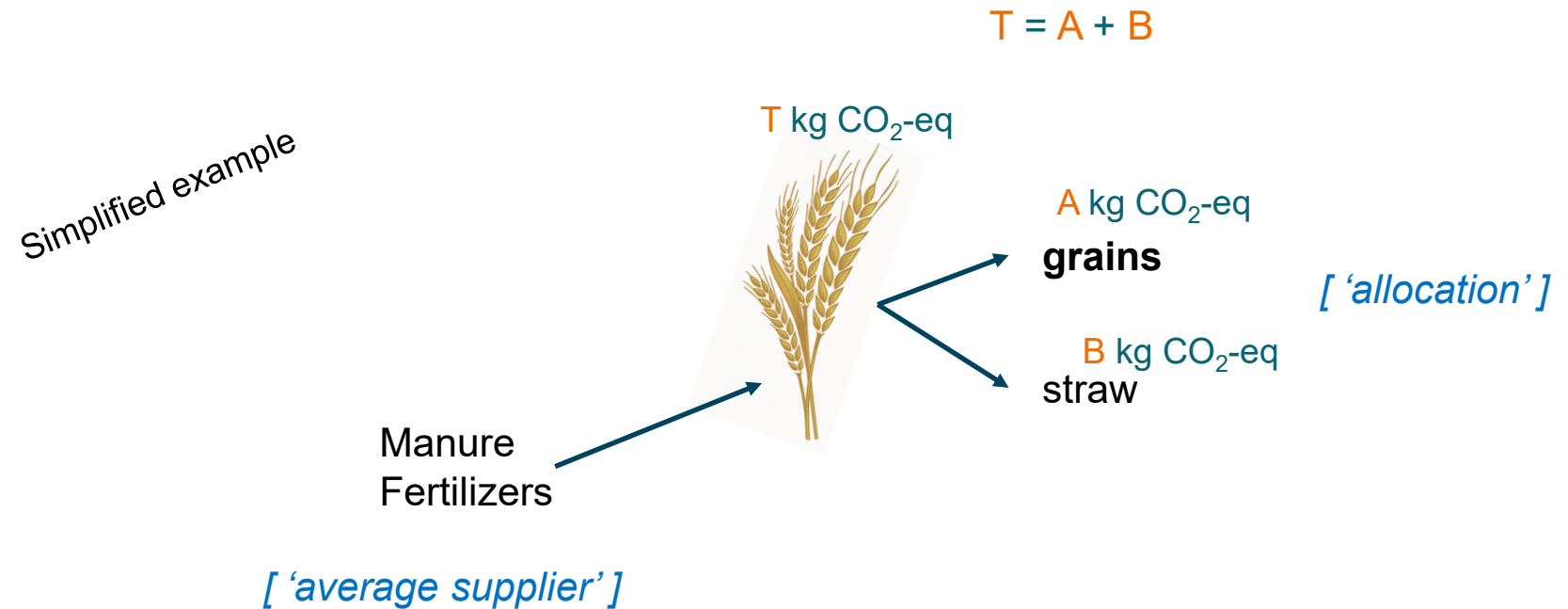
*Climate change, Acidification, Eutrophication (terrestrial, freshwater, marine), Ecotoxicity (terrestrial, freshwater, marine), Human toxicity (cancer, non-cancer), Land Use, Water use, Abiotic resource use (fossil and mineral)*

*[ Work in progress: biodiversity, animal welfare, geopolitical risk, ... ]*



# What are the environmental impacts of a product?

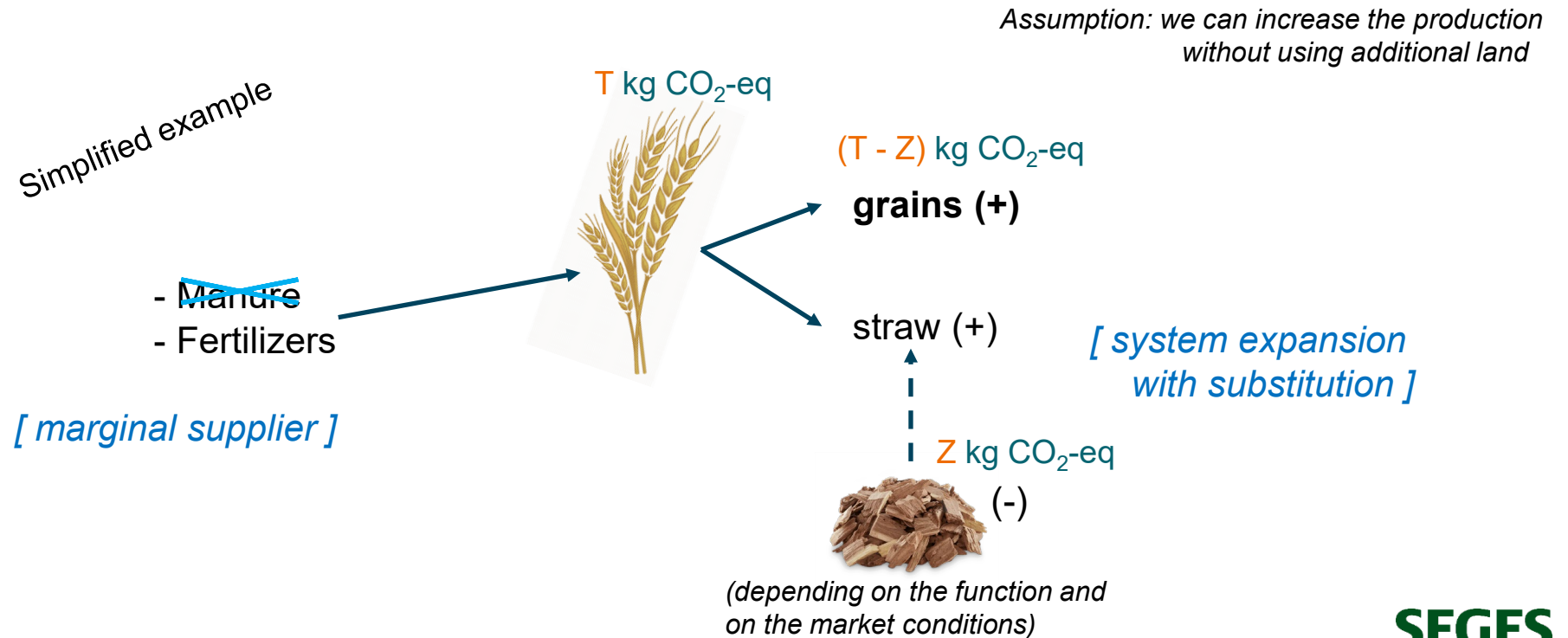
- What environmental impact is *Product\_X* responsible for?  
(accounting)      **Attributional LCA**



main product in **bold**  
(just an assumption for this example)

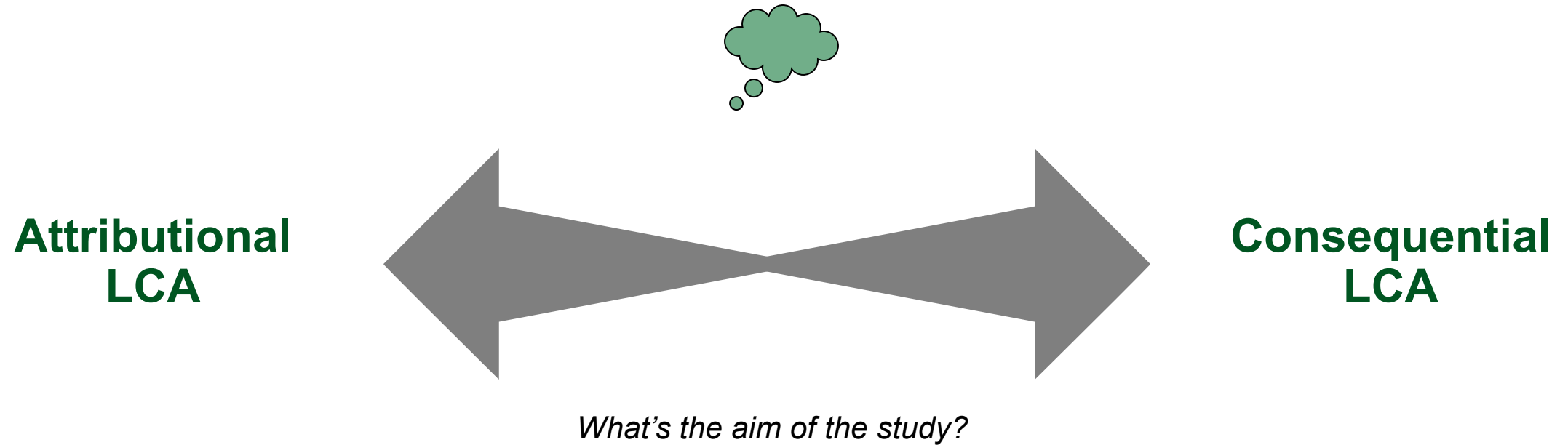
# What are the environmental impacts of a product?

- What are the environmental consequences of, for example, increasing the production of *Product\_X*?  
(market dynamics) **Consequential LCA**



main product in **bold**  
(just an assumption for this example)

# What are the environmental impacts of a product?





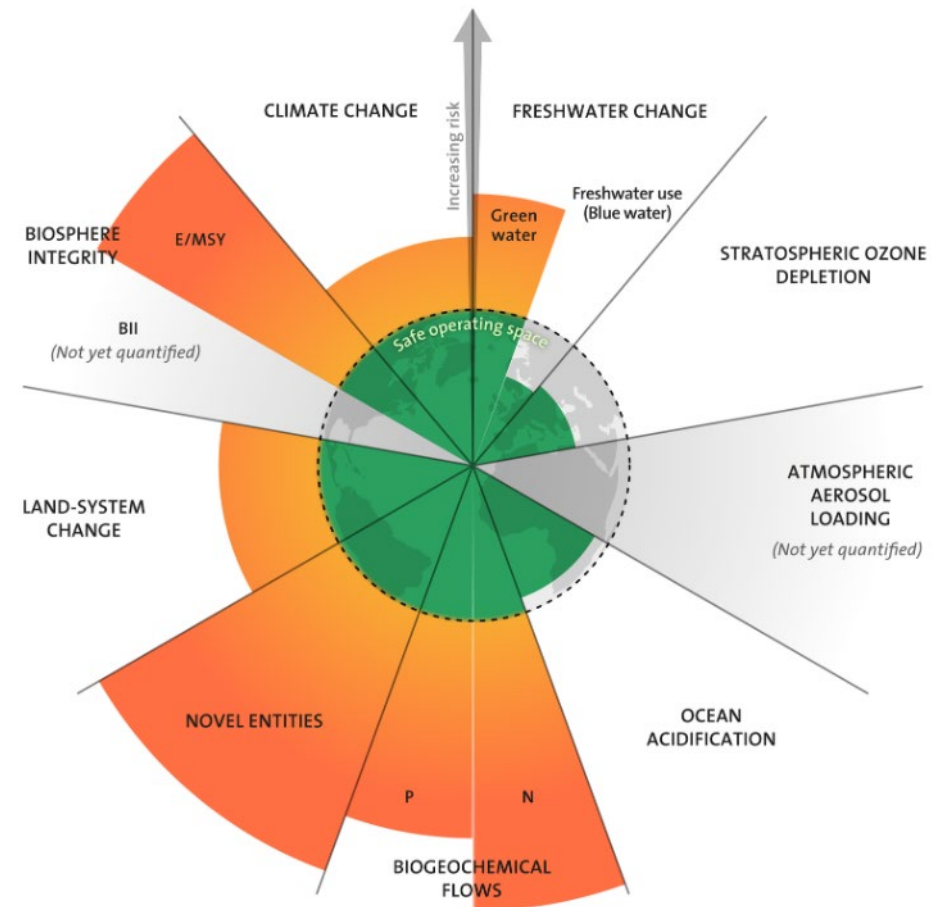
# The EU Product Environmental Footprint

- ❑ COMMISSION RECOMMENDATION of 16.12.2021 on the use of the Environmental Footprint (EF) methods to measure and communicate the life cycle environmental performance of products and organisations
- ❑ (see also Green Claims Directive)
- ✓ Product Environmental Footprint (PEF) method: general guidelines for the methodological framework
  - + specific PEF Category Rules: consensus on some further methodological details
    - [EU market players (>51% share) and EU]
- ✓ mostly attributional LCA
- ✓ full value-chain
- ✓ results for 16 impact categories to be included (with 'hotspot' contribution)
- ✓ dLUC included in the results (with iLUC possibly included in the Supplementary Material)
- ✓ (...)

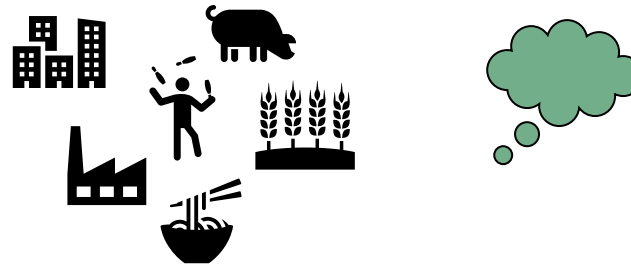
# Are we, as a society, doing good enough?

We need a "receptor (environment) perspective"  
(in contrast to the "producer / consumer perspective")

Are we within the environmental biophysical limits?  
(planetary boundaries; LCA-based model)



# THANK YOU



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# Changes in carbon stocks



Land Use change (LUC):

- a. “direct” replacement of forest / grassland (direct LUC; dLUC)
- b. a change in agricultural practice elsewhere (indirect LUC; iLUC)

often based on the PAS 2050-1:2012 approach

(e.g., ‘Indirect Land Use Change Model’, ‘GLOBIOM’, ...)

<https://iiasa.github.io/GLOBIOM/>

<https://lca-net.com/projects/show/indirect-land-use-change-model-iluc/>

Carbon Opportunity Cost (COC)

- c. the soil carbon loss / benefit of crop X compared with the native habitats

